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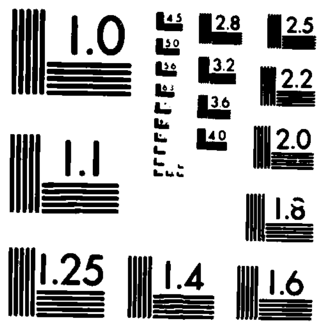

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INTEGRATED PERFORMANCE CRITERIA

FOR

HOUSING AND BUILDING HAZARD MITIGATION

FINAL REPORT

FOR

THE FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON, D.C.

EMW-C-1005
6121A

JULY 1, 1984

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HOUSING AND BUILDING HAZARD MITIGATION

FINAL REPORT

FOR

THE FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON, D.C. 20472

EMW-C-1005
6121A

BY

PROJECT COMMITTEE ON BUILDING SAFETY CRITERIA
OF THE
NATIONAL INSTITUTE OF BUILDING SCIENCES
WASHINGTON, D.C. 20005

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This report provides a proposed plan, schedule, and budget for a program to achieve disaster mitigation on a multi-hazard basis, through the development and utilization of integrated building performance criteria. The importance of a multi-hazard approach and the need for integrated performance criteria is explained. Principal tasks necessary to fully develop the plan and to accomplish the tasks that would be involved, and a definitive first year schedule with a tentative first year budget, are provided, as is a suggested schedule for ensuing years.

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PREFACE

This report of the National Institute of Building Sciences (NIBS), which is in the form of a program prospectus, is in fulfillment of Contract EMW-C-1005 between the Federal Emergency Management Agency (FEMA) and NIBS. This report was prepared by a Project Committee of the Institute's Consultative Council, and has been reviewed under Council procedures and approved for transmittal to FEMA by the Institute's Board of Directors.

The Board of Directors of the Institute and the Institute's Consultative Council wish to thank the members of the Project Committee and its Steering Committee, under the Chairmanship of H. J. Roux, and all those who gave so generously of their time and knowledge to this project.

INTRODUCTION

The contract between the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS) was in response to language contained in Senate Report No. 97-163, July 23, 1981, as follows:

> "...the Committee [Committee on Appropriations] expects FEMA to enter into contractual relations with the National Institute of Building Sciences to undertake studies on performance criteria for fire-safe housing and building design, and a study to determine the adequacy of current civil defense shelter specifications."

The full text of the Statement of Work in the contract, which actually is the proposal submitted to FEMA by NIBS, is shown herein as Appendix "A." In essence, it calls upon NIBS "...to prepare a detailed program and budget for the development...of civil defense shelter and fire-safe building design performance criteria." The reason for this limited initial objective--i.e., preparation of only a proposal--was the representation by FEMA that it did not have adequate funds in its fiscal year 1982 budget to fund the studies expected by the Congress. Therefore, the contract and this report address only a plan for achieving the longer-range goals being sought.

As will be seen from the Statement of Work, it became apparent to NIBS early on that there was a need to:

1. develop criteria for all of the hazard mitigation programs assigned to FEMA--i.e., flood, earthquake, civil defense, and fire;

2. relate criteria for these hazards to others, and ultimately to all aspects of performance; and,

3. develop these criteria in such a way that they become the foundation upon which public and private housing and building regulations can be based, as well as satisfy FEMA's interests.

As the Work Plan was developed (April 8, 1983) for this initial project, the concept of integrated performance criteria for hazard mitigation was further articulated:

> "This work plan describes the initial phase of a program that is intended to lead to the creation of integrated performance criteria that will mitigate against life and property loss in buildings due to the effects of

> fire and other natural and man-made forces, including those due to earthquakes, floods, high winds, explosions, and nuclear weapons. The program is intended to significantly advance the state-of-the-art, and thus, is targarted to achieve a quantum jump in the approach to peformance goal-setting and performance prediction."

FEMA concurred in this "integrated criteria" approach; indeed, it fit well with a similar philosophy being developed within FEMA of an integrated approach to disaster-preparedness. In its March 8, 1983 testimony before the HUD and Independent Agencies Subcommittee of the Senate Committee on Appropriations, NIBS briefly described the course this project was taking and in its June 14, 1983 report (Senate Report No. 98-152), the Subcommittee stated:

> "The Committee is pleased to note that FEMA has initiated work with the National Institute of Building Sciences (NIBS) on performance criteria for fire-safe building design and determining the adequacy of current civil defense shelter criteria as called for in its Report No. 97-163. The Committee is particularly pleased that the administration and NIBS have redirected this program so as to deal with multiple natural and man-made hazard criteria. The Committee believes that this work should be accelerated."

At the time the work plan was developed--prior to the formation of the NIBS Project Steering Committee--the intent was to focus initial efforts on fire because of its pervasiveness in natural and man-made disasters--e.g., as a consequence of wind and earthquake damage, explosions, and day-to-day operation of facilities of all kinds. However, after the Steering Committee had been formed and as its deliberations progressed, it became clear that doing so could result in setting a direction for performance criteria development that would not be applicable to other forces acting on buildings. As a consequence, there was a return to the multi-hazard approach--at least to a representative number of such forces or phenomena--so as to ensure the greatest extent possible that integrated criteria would flow from the program. The program prospectus presented in this report, then, is one that is inclusive, rather than exclusive.

It is the hope of the NIBS Board of Directors that FEMA and others will implement and build upon the program proposed herein to the end that the total national interest, as well as that part of the total national interest that FEMA is charged with executing, will be well served.

PROGRAM PROSPECTUS

The objective of the multi-year program described herein is to develop and promulgate integrated building safety performance criteria that will:

1. Enable public policy makers at the Federal, State and local levels of government to discharge their respective fiscal and public health, safety, and welfare responsibilities as they relate to the mitigation of the effects of natural and man-made hazards on new and existing buildings--e.g., the effects of earthquakes, high winds, floods, fires, and nuclear and other detonations--by establishing a single, quantified, cost-beneficial level of required performance, irrespective of the number of hazards involved, for individual buildings and/or buildings within a given community, of stated importance from the standpoints of life safety, property protection, and functional continuity of operation.

2. Enable public and private building owners to likewise establish required performance for hazards and at hazard levels that transcend those addressed by public policy.

3. Provide scientific and technical basis for the creation and maintenance of integrated and/or integratable standards, regulations, specifications, and manuals of accepted practice that implement chosen performance levels.

BACKGROUND

Because of the differing and changing roles of the several levels of government, private sector entities, and individuals, and because of regional and even local geophysical, demographic and other differences, hazard mitigation efforts have been, and largely continue to be, uneven in terms of the hazards addressed and the nature and level of performance sought.

Historically, the regulation of construction for public health and safety--has been considered to be within the province of the States under their police powers (or within the province of communities where the States have delegated such authority). As population and population densities increased, sanitation and fire became major public health and safety concerns. These were of major concern to the individual building owner-user as well, and, to the merging insurance industry. With the passage of time, additional hazards became of concern--e.g., earthquakes, principally in the far west; and hurricanes in coastal areas, particularly in the South Atlantic and Gulf Coasts states.

In very recent times, concern has grown for the potential impact of large-scale disasters on the economic viability of entire communities and even of national government. Therefore, increasingly, the public welfare concerns have become a major factor in regulatory decisions. Also, the Federal Government has expanded its involvement through a variety of assistance programs such as flood insurance and low-interest loans and other aid to disaster victims. Most of the disaster-related concerns--if not the programs themselves--have been brought under the purview of the Federal Emergency Management Agency (FEMA), and FEMA is now adopting a multi-hazard approach to its management responsibilities.

This multi-hazard approach is the essence of this project. Today there are concerns for the effects of such diverse forces impacting buildings as rain, snow, flood, avalanche, landslide, explosion (including nuclear weapons effects and associated radiation), high winds, wind and water-borne debris, sonic boom, earthquake, tsunami, volcano, expansive and dessicating soils, subsidence, deterioration, and, of course, fire. Some of these occur frequently, others infrequently, even on a geologic time scale. Some produce disastrous effects that are immediate, while others produce effects that are cumulative, even though the ultimate result is disastrous--e.g., corrosion, decay, and fatigue. Some effects are site and/or building specific, while others are areawide.

Because of the unique nature of many of these hazards, and because many of them became a matter of public and/or private concern at different points in time and often within different and limited spheres of interest, there has been very little coordination of mitigation efforts, let alone efforts to relate understanding of the several phenomena and their impacts on buildings, building occupants, and building functions. More importantly, integration--i.e., coordination of mitigation efforts--has not been applied to the regulation of new and existing buildings.

To state it another way, the historical approach to building performance has largely been one of trial and error. Innovative constructions were put forward and to the extent that they succeeded, they were emulated; conversely, to the extent they failed, they were removed from the lore of acceptable solutions. Rarely, however, were the causes of either success or failure thoroughly understood in a measurable sense. Indeed, in many areas of housing and building technology, there has been and still is little or no agreement on what constitutes satisfactory, or even the parameters of satisfactory, performance. Certainly, there has been no real attempt to seek comparable performance with respect to each of the many hazards involved. In the case of occupancies, for example, requirements have tended to be more stringent for commercial than for residential structures--

particularly, single-family residences--even though the loss of life has been greater in the latter. However, some of these differences can be attributed to the historic presumption that individuals and individual families have the right and responsibility to determine the risks to which they want to be exposed, so long as they do not harm their neighbors in doing so.

As another example, in the case of fire, it would seem that initial attention was given to controlling flame spread from structure to structure so as to reduce the likelihood of mass fires, such as the 1871 Chicago Fire, and the fire after the 1906 San Francisco Earthquake. From there, efforts moved toward avoiding and controlling fires at the level of individual structures, and more recently, of spaces within individual structures. In the case of other hazards, such as wind, flood, and earthquake, much of the same pattern has emerged, except that the initial source of the hazard is external rather than internal as is the case with fire. Overall, however, the trend has been to be more and more stringent--in effect, to employ any and all applicable hazard-mitigating technologies as they emerge, regardless of their cumulative effects on costs or benefits. Conversely, there has been insufficient recognition of the potentially devastating economic, to say nothing of human, consequences of multiple failures, such as might result from a major earthquake followed by fire, or a widely-spread destructive force such as flooding into a populated river basin.

To achieve the objective of integrated performance criteria requires: (1) the ability to delineate in measurable terms the level of building performance that will express the degree of hazard mitigation desired; and, (2) the ability to do so in a manner that ensures nearly equal risk for each hazard addressed. It follows that it is equally important that means be developed to predict that the performance targeted is being achieved in the case of existing construction or will be achieved in the case of new or rehabilitated construction.

It is realized that achieving the objective will be immensely difficult; however the potential rewards in terms of getting the performance desired and of eliminating needless overlap, duplication, and conflict in hazard mitigation features, are infinitely greater. It is certainly clear that the current essentially prescriptive approach to hazard mitigation provisions does not assure comparable levels of safety for the different hazards, nor does it provide any assurance that provisions for dealing with any one hazard will not overlap or conflict with those for another hazard. And, the ability to establish cost-beneficial levels of performance in all areas simply does not now exist.

PROGRAM PLAN

In addition to the principle objective, the program described herein is based on several precepts:

1. That the needs of all participants in the design-build-operate process (administrative officials, including code enforcement officials; planners; architects and engineers; building owner-users; building financers and insurers; producers and distributors; builders and contractors; and operation and maintenance personnel) will be addressed.

2. That performance criteria for hazard mitigation will be so structured that they can be compatible with performance needs in such areas as energy conservation, security, environmental impacts, cost-effectiveness, and building function.

3. That performance criteria will enable individual communities, as well as other public and private entities to achieve comparable levels of safety to life, protection of property, and operational continuity that are tailored to their respective needs and economic capabilities.

4. That performance criteria developed will lead to:

   - o better strategies for planning and design;
   - o new and more effective hazard mitigation;
   - o improved professional practice through better access to information and training in its use;
   - o improved administrative procedures and practice at all levels of government; and,
   - o doable approaches within legal and other constraints.

Envisaged are four principle <u>tasks</u>:

1. <u>Requirements</u> - Development of a common set of indicators for use in describing desired performance levels, irrespective of the number or types of hazard involved, and with respect to three relevant components of performance--i.e., safety to life, protection of property, and continuity of facility operation. This might be done, for example, in terms of death and injuries per man hours of exposures, and dollars and time lost per event.

   The goal is to enable policy makers to quantify the level of performance to be achieved and/or maintained in a specific building, a combination of buildings, and an entire community.

2. <u>Building Types and Elements</u> - Development of a means for quantitatively characterizing facilities as to their vulnera-

bility and importance; of identifying and quantifying those physical and operational elements and features of facilities that are important to the achievement of hazard mitigation; and of expressing the hazard impacts on these elements.

The goal is to be able to trace the effects of the various internal (e.g., fire) and external (e.g., wind) forces on subsystems (e.g., structural, envelope, HVAC); components (e.g., beams, columns, diaphragms, walls, floors); products (e.g., windows, fans, elevators); and, materials (e.g., concrete, steel, wood, aluminum, and glass).

3. <u>Performance Criteria</u> - Development of prototypical draft criteria for each of the selected, representative, short-term hazards (fire, earthquake, high wind, flood, and explosions, including nuclear weapons effects, having been selected as reasonably representative of short-term natural and man-made impacts on buildings) as distinct from long-term impacts such as corrosions and wood-destroying organisms--such criteria to include:

   a) specific guidance as to how performance is to be defined and a selected level of performance specified;

   b) the way(s) forces emanating from the selected phenomena are to be brought to and through the structure and its elements and vice versa;

   c) the way structure and element response to the impacting forces is to be defined in terms that translate to the relative achievement of performance goals;

   d) acceptable evaluative techniques (i.e., methods to be used to predict the performance that will be achieved); and,

   e) a commentary for dealing with situations where qualitative judgments must substitute for the lack of quantitative capabilities, or it is otherwise not possible to be definitive.

4. <u>Integration</u> - On-going evaluation of the several criteria development efforts (Task 3); development of prototypical performance criteria that integrate the several separate criteria in such a way as to achieve comparable levels of performance; and, the testing of the prototypical criteria through the mechanisms of trial design targeted at facilities that have already been designed and constructed using exact methods and procedures, commencing with the targeting of performance goals by policy makers.

Each of these four separate tasks should be carried out by a highly qualified group with overall direction of the work assigned to a steering group with broad comprehension of the need and technology.

A multi-year (four to five years) program is envisaged, ending in prototypical integrated natural and man-made hazard mitigation performance criteria and a plan for their further development and ultimate use of such criteria in achieving performance-based integrated standards, regulations, specifications, and manuals of accepted practice. All task groups--and in the case of Task Group 1, two look-alike subgroups--should be activated in the first year; however, because of the need to establish a firm foundation for the more substantive parts of the program in the later years, the initial goal should be limited.

During year one, the following should be undertaken:

1. Task Steering Committee - Steering Group development of detailed charges for each task group, review and further definition of the work schedule contained herein, conduct of an orientation meeting with participation by all involved in the various tasks and others to evolve mechanisms for broadening building community participation in the program, monitoring of progress, preparation of progress reports, and development of a detailed second-year work plan and preliminary whole-program work plan. In addition, the Steering Group should identify the full range of natural and man-made hazards that ultimately must be addressed to achieve integrated criteria, and establish commonalities and conflicts. It also should begin the process of identifying the problems that must be addressed at the interfaces between performance criteria development and risk-level determinations by policy makers, and the creation of standards, regulations, specifications and manuals of accepted practice, although the need for this product is well downstream.

2. Requirements Task Group - This task group should carry out a literature search to establish the level of knowledge concerning performance-level indicators across the full range of natural and man-made hazards, as they relate to safety of life, protection of property, and maintaining continuity of facility operation. In addition, the task group should establish what it knows about the de facto level of performance implied by the existing model codes and selected standards and specifications, and develop an initial hierarchy of hazard mitigation objectives and indicators. The latter--i.e., establishing initial objectives and indicators--should be addressed by two look-alike task subgroups. Because of the importance of this work, two equally qualified subtask groups should be established and given an identical charge. The result could be mutually supportive findings, two different ways of achieving the

stated objectives, or one direction with greater potential than the other.

3. <u>Building Types and Elements</u> - This Task Group should conduct a literature search to establish (list) what is known about the way the selected natural and man-made phenomena impact building occupants and the various physical elements and operational aspects of the buildings themselves, with the aim of classifying structures and aggregations of structures--e.g., by occupancies, structural types, criticality. This task group also will be asked to distill from collected information what can be said about impact evaluation techniques--i.e., analytical, test and judgmental methods of performance prediction--and their likely applicability to the several hazards involved.

4. <u>Performance Measurement Task Group</u> - This Task Group should have five separate task subgroups--one each for fire, earthquake, wind, flood, and explosions (including nuclear weapons effects). This Task Group also should be charged with carrying out a literature search on the state-of-knowledge concerning performance criteria. This should be done for each of the separate phenomena, and for buildings as a whole.

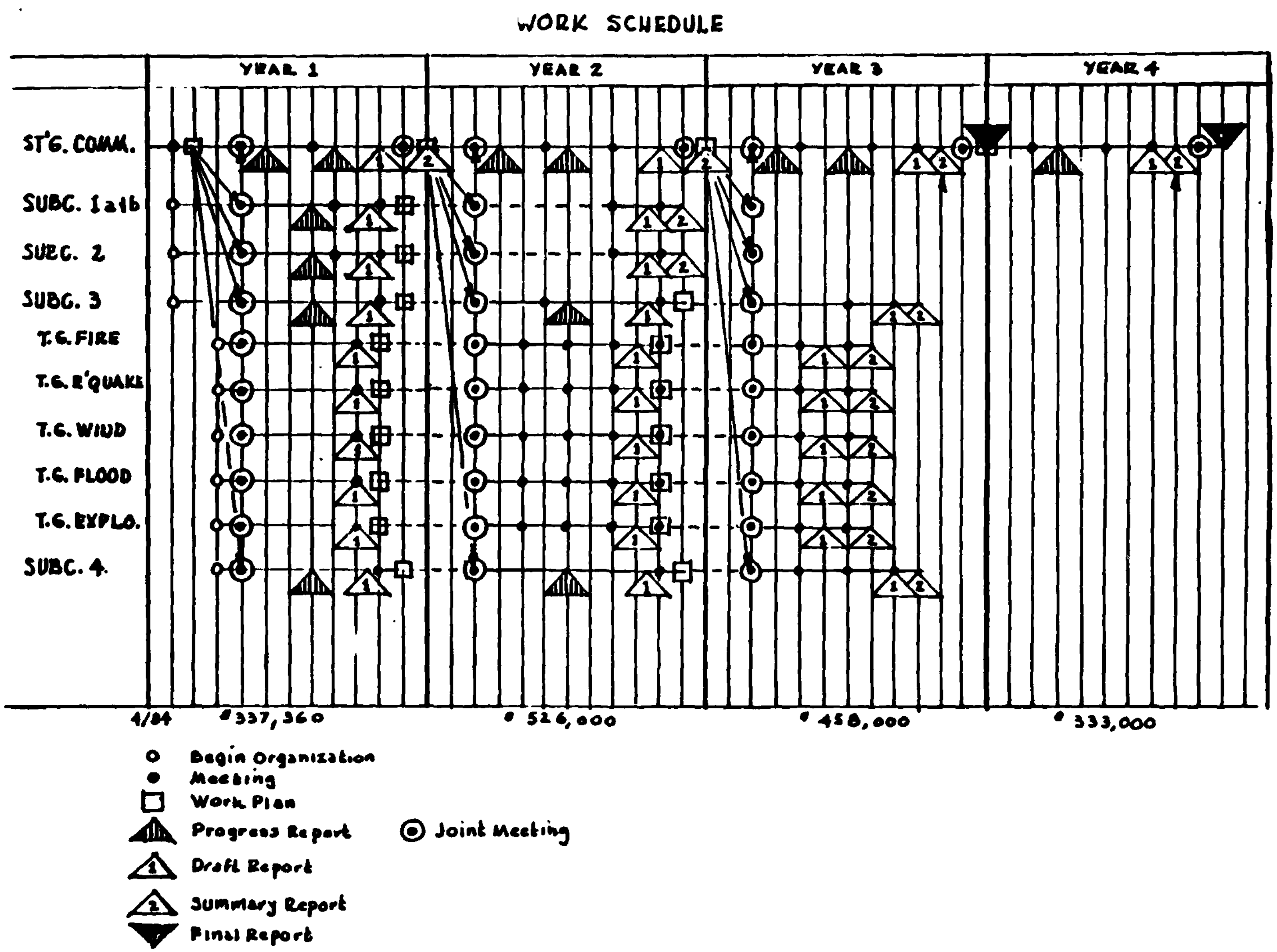
5. <u>Integration Task Group</u> - This Task Group should have as its function the conduct of an on-going evaluation of the work of the other task groups with a view to identifying ways in which criteria can be integrated. In this sense, this task group will be preparing itself for the downstream task of prototypical performance criteria development.

6. <u>Steering Group</u> - Throughout the year, the Steering Group should serve as a source of input to and a reviewer of the products of, the several task groups, and develop the proposed second-year program.

   During the second and succeeding years, not only will the work of the several task groups increase in depth and intensity, but the Steering Group will need to give ever-increasing attention to the involvement of the ultimate users of the criteria, so as to ensure a knowledgeable and receptive audience. Attention also will need to be given to creating a system for performance measurement in relation to criteria established and feedback for criteria improvement. Throughout, hazard avoidance, through such techniques as land planning, needs to be given appropriate attention.

<u>SCHEDULE</u>

The proposed work schedule--definitive for the first year and suggestive for the ensuing years--is shown in Figure 1.



WORK SCHEDULE
YEAR 1
YEAR 2
YEAR 3
YEAR 4
ST'G. COMM.
SUBC. I a&b
SUBC. 2
SUBG. 3
T.G. FIRE
T.G. E'QUAKE
T.G. WIND
T.G. FLOOD
T.G. EXPLO.
SUBC. 4
4/84
$337,360
$526,000
$458,000
$333,000
Begin Organization
Meeting
Work Plan
Progress Report
Draft Report
Summary Report
Final Report
Joint Meeting

Fig. 1

BUDGET

The estimated budget for the first--tentatively from April 1984 through March 1985--is as follows:

Personal Services			
Professional (Project Director)		46,000	
Secretarial/Clerical		18,000	
Consultants		22,500	86,500
Fringe Benefits			23,040
Travel			
Steering Group		12,000	
Task Groups			
Requirements			
Task Subgroup 1	7,500		
Task Subgroup 2	7,500	15,000	
Building Type & Elements		7,500	
Performance Criteria	2,500		
Wind Subgroup	5,000		
Earthquakes Subgroup	7,500		
Flood Subgroup	5,000		
Fire Subgroup	5,000		
Explosions Subgroup	5,000	30,000	
Integration		2,500	
Staff		1,000	
Consultants		2,500	70,500
Communications and Shipping			24,000
Supplies and Services			12,000
Subcontracts			20,000
Indirect Costs (est.)			98,445
			$334,485

For the period from April 1984 through September 1984, the budget would be $167,243, to be raised through grants/contracts/cooperative agreements with FEMA and other interested government agencies, and grants from interested private organizations.

APPENDIX A

PROPOSAL TO PREPARE A DETAILED PROGRAM FOR THE DEVELOPMENT OF CIVIL DEFENSE SHELTER AND FIRE-SAFE BUILDING DESIGN PERFORMANCE CRITERIA [July 22, 1982]

Background

In adopting Senate Report No. 97-163 as part of its Fiscal Year 1982 appropriation actions, the Congress stated its expectations that the Federal Emergency Management Agency (FEMA) would enter into contractural relations with the National Institute of Building Sciences (NIBS) to "...undertake studies on performance criteria for fire-safe building design, and a study to determine the adequacy of current civil defense shelter specifications."

It is recognized that FEMA does not promulgate civil defense shelter "specifications" per se; however, FEMA has developed and provided technical evaluation services and technical guidance to the building community that in effect do establish criteria for the design, construction, and operation of fallout shelter for given exposure conditions. In 1983, FEMA proposes to give increased attention to analyses and pilot activities for protection of key defense and population relocation industries, and in that regard, to criteria for blast shelter construction. The latter, of necessity, will require attention to protection against thermal radiation as well. Therefore, even though FEMA and its predecessor agencies have not ignored these other nuclear explosion effects in the past -- i.e., thermal radiation and blast, as distinct from radioactive fallout -- the increased emphasis on the former will enable FEMA to complete the array of technical evaluation services and guidance available to the building community and the nation for protection against such hazards.

One of the most pervasive of the health and safety hazards in building is fire vulnerability. The fire hazard is associated with virtually all other natural and man-made building hazards -- e.g., wind, earthquake, flood, and explosions -- and is a major hazard under normal, day-to-day conditions of building occupancy and use. Therefore, FEMA has a deep interest in mitigating the fire hazard and in the realization of performance criteria for fire-safe building design, construction, and operation. This interest has been lodged principally in the U.S. Fire Administration; however, as noted, mitigation of the fire hazard is of concern to all of the hazard mitigation programs of FEMA.

The Issues

Because the vast majority of residential and other types of buildings are privately financed and owned, and because the regulation of such construction generally is limited to the public health and safety aspects of performance and largely within the province of State and local units of government, it has always been difficult for the Federal Government to significantly affect specific aspects or the whole of the performance of the nation's housing and building inventory. Efforts by the Federal Government to do so outside the normal building and building regulatory processes have all too frequently proven to be counterproductive because of overlaps, duplications, and outright conflict in technical guidance and regulation that occur. It is important, therefore, that Federal agencies such as FEMA that have been given responsibility for improving aspects of the performance of the nation's building inventory, find ways to carry out these missions that will fit well with the ongoing building and building regulatory processes.

This need to find a fit has been recognized by FEMA in various ways and to varying degrees within its several hazard mitigation programs -- i.e., the flood insurance, earthquake hazard mitigation, civil defense shelter, and fire programs. In its continuing internal organizing efforts, FEMA also has begun to address the need to interrelate the technological as well as programmatic aspects of the several natural and man-made hazard mitigation programs. Further, FEMA has evidenced recognition that technological interrelationships extend to performance aspects outside its own areas of cognizance -- e.g., in documents it has produced such as "Building Design for Radiation Shielding and Thermal Efficiency" and "Fallout Protection and Energy Conservation."

What is needed to synthesize and carry these efforts further is a technologically-based mechanism for making the fit between the various aspects of housing and building performance FEMA is charged with improving; between these aspects of performance and all others, regulated and unregulated; and, between FEMA's efforts and the ongoing housing and building regulatory processes.

One of the most effective ways this can be done is by creating performance criteria -- i.e., determining the measures of performance and how various levels of performance can be predicted -- for the several areas of FEMA's hazard mitigation cognizance. This technique can be effective because it separates measurement from the largely socioeconomic function of decision-making as to specific performance levels to be achieved in given situations. Sound performance criteria will recognize relationships with other performance parameters and provide the basis for standards, regulation, and specification decisions. By taking the additional step of describing performance in cost-benefit and risk terms, it is possible to provide decision-makers with specific guidance as to how a given hazard mitigation objective can be achieved and at what cost.

NIBS proposes to prepare a detailed program and budget for the development by NIBS in Fiscal Year 1983 of civil defense shelter and fire-safe building design performance criteria. Specifically, the program will delineate how the following will be provided:

- performance criteria for use by FEMA in assessing the technical adequacy of current -- and setting targets for proposed -- physical facilities, technical evaluation procedures and technical guidance on the design, construction, and operation of civil defense and defense-related private facilities; and, for use by voluntary standards, codes and specification bodies, and public and private regulatory entities, in establishing technical performance requirements;

- performance criteria for use in assessing the fire safety performance levels currently being achieved through housing and building design, construction, and operation practices and regulation under both day-to-day occupancy hazards and natural and man-made disaster hazards; and, in targeting future hazard mitigation goals and procedures.

APPENDIX B

PROJECT COMMITTEE
ON
BUILDING SAFETY CRITERIA

Steering Committee

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Vice Chairman

JASON C. SHIH, Director, Office of Building Research, School of Architecture, Louisiana State University, Baton Rouge

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INTEGRATED PERFORMANCE CRITERIA
FOR
HOUSING AND BUILDING HAZARD MITIGATION

UNCLASSIFIED

NATIONAL INSTITUTE OF BUILDING SCIENCES
JULY 1, 1984

15 pages
EMW-C-1005
6121A

ABSTRACT
This report provides a proposed plan, schedule, and budget for a program to achieve disaster mitigation on a multi-hazard basis, through the development and utilization of integrated building performance criteria. The importance of a multi-hazard approach and the need for integrated performance criteria is explained. Principal tasks necessary to fully develop the plan and to accomplish the tasks that would be involved, and a definitive first year schedule with a tentative first year budget, are provided, as is a suggested schedule for ensuing years.

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SUMMARY

INTEGRATED PERFORMANCE CRITERIA

FOR

HOUSING AND BUILDING HAZARD MITIGATION

FINAL REPORT

FOR

THE FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON, D.C. 20472

EMW-C-1005
6121A

BY

THE PROJECT COMMITTEE ON BUILDING SAFETY CRITERIA
OF THE
NATIONAL INSTITUTE OF BUILDING SCIENCES
WASHINGTON, D.C. 20005

JULY 1, 1984

SUMMARY

This report responds to a contractual requirement between the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The full text of the Statement of Work in the contract calls upon NIBS "...to prepare a detailed program and budget for the development...of civil defense shelter and fire-safe building design performance criteria." This report actually has a limited initial objective because FEMA did not have adequate funds in its fiscal year 1982 budget to fund the full studies expected by the Congress. Therefore, the contract and this report address only a plan for achieving the longer-range goals being sought.

It became apparent to NIBS early that there was a need to:

1. develop criteria for all of the hazard mitigation programs assigned to FEMA

2. relate criteria for these hazards to others, and to all aspects of performance; and,

3. develop these criteria in such a way that they become the foundation upon which public and private housing and building regulations can be based, as well as satisfy FEMA's interests.

As the Work Plan was developed, the concept of integrated performance criteria for hazard mitigation was further articulated and FEMA concurred in this "integrated criteria" approach. The program proposed in this report is one that is inclusive, rather than exclusive and should result in useful integrated performance criteria.

END

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